

# User manual

Product description  
Controller PSC 3



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## About the Delta PSC 3 controller

This document has been created for PSC 3 software version 2.6x. The document is updated only when necessary when new software versions are released.

PSC 3 is a sophisticated power system controller that can be used for both small and very large, complex power systems. It consists of a single central unit, which provides basic I/O periphery. A very robust and reliable CAN standard-based communication bus (IMBUS) provides easy expansion.

PSC 3 uses external modules for monitoring system elements. This modular approach is perfect for expandable power systems with decentralized distributions (BDFB) and batteries in separate rooms. The integrated PLC offers the flexibility for monitoring and control of auxiliary devices, system upgrades, and capacity expansions.

The enhanced system functions provided by PSC 3 help reduce operating costs and improve availability. Battery management, for example, is one of the key factors for the availability of a power system. Regular capacity tests by PSC 3 significantly improve battery management. PSC 3 also allows remote alarms by means of potential-free relay contacts, modem, or LAN/Ethernet or via SMS. The SNMP functionality offers enhanced remote alarms working with SNMP managers. The alarms are classified as critical, urgent or non-urgent alarms.

An integrated web server offers a user-friendly graphical interface for detailed monitoring and control using a web browser. The PSC 3 can be accessed from virtually anywhere, over intranet or Internet, or by modem. The user interfaces can be localized, supporting up to two additional languages besides English.

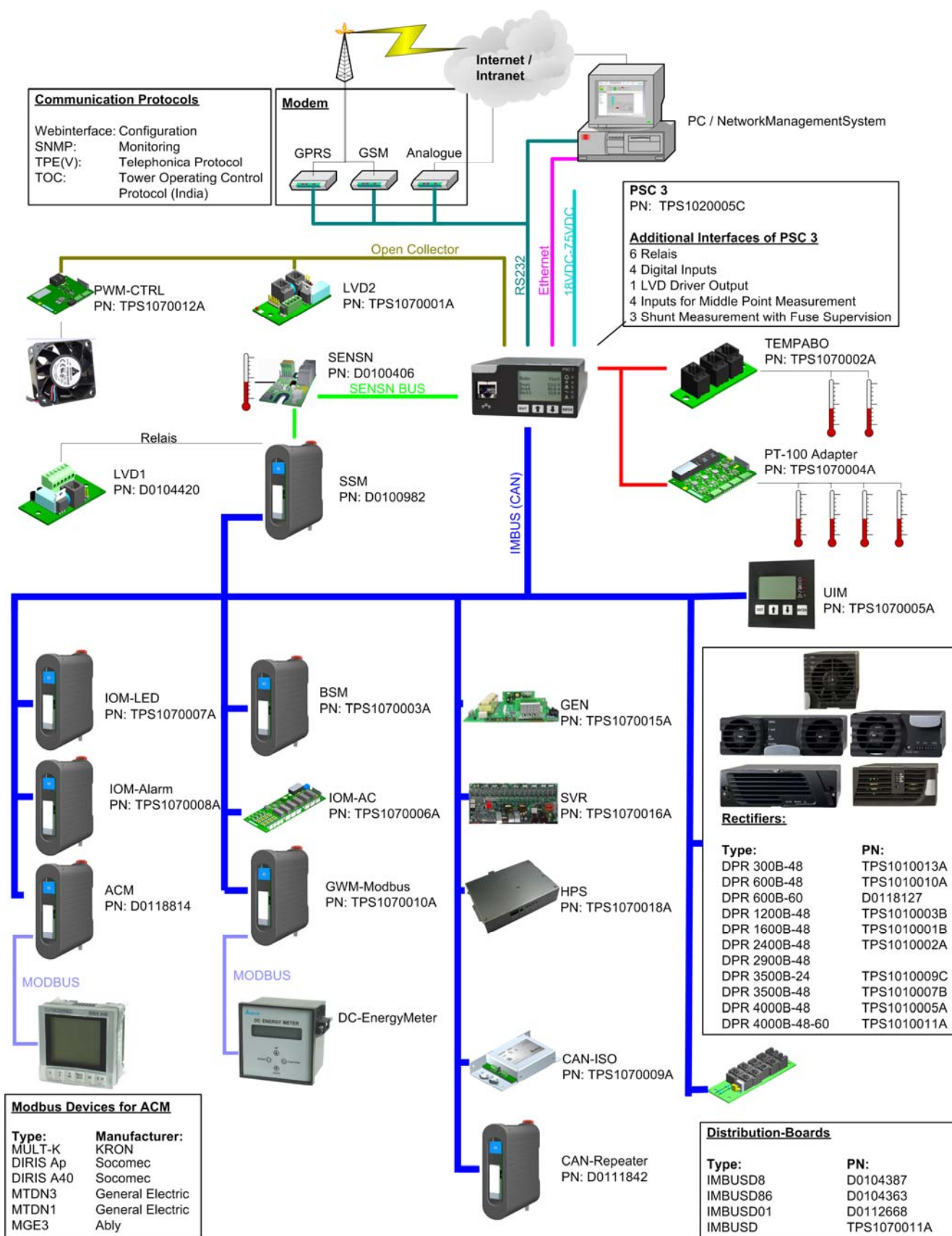


Figure 1. PSC 3, the heart of a modular power system

## 2 Features overview

The key features of a PSC 3 system include:

- Modular concept: PSC 3 can be customized for both small and large systems
- Flexible setup and supervision of battery-, source- and load strings
- Remote system supervision over intranet, Internet and modem
- Remote software update of system components
- AC mains voltage measuring without external equipment

PSC 3 offers the following features:

- Local system monitoring and basic setup with display, keypad and 5 alarm LEDs
- Flexible event processing for alarm management
- 3 Alarm levels: Critical, Urgent, Non-urgent
- Localization of user interface, supporting up to two additional languages
- Ethernet interface to PC or LAN
- Modem or RS 485 interface
- 3 inputs for shunt measurement, current and fuse supervision
- 4 inputs for battery middle point measuring
- 2 RECTS interfaces
- 2 IMBUS interfaces using CAN bus
- 6 digital relay outputs (changeover contacts, pluggable clamp connection)
- 4 digital open collector outputs
- 4 digital inputs
- 2 inputs for temperature sensors
- Real time clock
- LVD driver relay output
- DHCP server and auto-detect of Ethernet cable type for easy connection to a computer

Additional HW and/or SW components extend the range of features to include:

- Expandable number of voltage measurements for battery blocks
- Rectifier positioning
- Expandable number of battery- / load- / source-strings (current, voltage, temperature, fuse supervision)
- Expandable number of relay outputs for alarms or LVD/LVLD
- Expandable number of LED outputs for alarm or status indications
- Expandable number of digital inputs with individual threshold and hysteresis
- 2 local user interface modules with additional buzzer (UIM)
- AC measurement with external module (3-phase voltage, current, frequency, power, energy)
- Genset control including measurement of AC output parameters
- Static voltage regulation via SCR drivers / multiple tap transformer
- Healthy phase selector
- Speed control for cooling fans of outdoor cabinets or containers
- RS-485/Modbus interface to communicate with DC energy meters
- SNMP for reporting events to a network supervision device
- Forwarding alarms via SMS

## 3 Functional overview

The main task of the system controller is to enhance the reliability and lower the operating and maintenance costs by:

- Controlling the rectifiers to run at the highest efficiency.
- Extending the battery life time by providing the best possible conditions.
- Informing the user in case interventions are needed and providing the necessary information for corrective actions.

### 3.1 Battery functions

The system controller includes the following charge functions, with or without temperature compensation:

- Float charge
- Boost charge
- Equalize
- Event controlled charge (for example, generator set usage)

The test functions include:

- Constant current, capacity, real load, and time based battery tests
- Natural battery test (using the opportunity of a mains failure)
- Separate discharge/charge of a battery

The protection functions include:

- Disconnection (due to low voltage or mains failure plus delay)
  - Battery disconnection
  - Full and partial load disconnection
- Charging current limitation

The supervision functions include:

- Loss of back-up time
- Middle point voltage supervision
- String current comparison
- Block voltage measurement

### 3.2 Source string function

The current from solar converters and wind generators can be measured by shunts in so-called source strings and such upgrading a power plant to a RHPS (Renewable Hybrid Power System).

### 3.3 Rectifier functions

The control functions include:

- Efficiency mode – optimizes the system for efficiency, switches off unused rectifiers, and so on
- Forced rectifier cycling - balancing the operation time of rectifiers

The supervision functions include:

- Redundancy supervision – alerts if there is no redundant rectifier
- Recharge power supervision – alerts if there is not enough power to recharge battery within specified time

### 3.4 Signal processing engine

PSC 3 has a built in Signal Processing Engine, which allows defining reactions to react to events initiated by specified parameter changes. The user may define as many events as needed on all digital inputs as well as on measurements, such as voltage, current, and temperature using signal conditioning. Events may be combined using logical functions AND, OR, Boolean inversion, signal filtering, latching events, and timer events.

### 3.5 AC measurement function

PSC 3 measures basic mains voltages using the connected rectifiers. The measured values can be viewed via local and / or web user interface:

- Phase-Neutral voltages

The optional HPS module can be used to measure the parameters of the AC network:

- Phase-Neutral and Phase-Phase voltages
- Currents
- Apparent power
- Active power
- Energy
- Frequency

With the ACM1 Gateway Module it is possible to connect a commercial 3 phases AC-measurement device, providing more AC information:

- Phase-Neutral and Phase-Phase voltages
- Currents
- Active power
- Frequency
- Power factor

The measured values are visible via local / web user interface, too.



## 4 User interfaces

### 4.1 Web user interface

An integrated web server provides the interface for monitoring and controlling the power system by a computer with a standard web browser.

The PSC 3 Configuration and Supervision Tool offers flexible and comprehensive configuration and supervision functions for power systems. It can be operated by almost all common web browsers. Access to controller and system functions is provided with user and session management features.

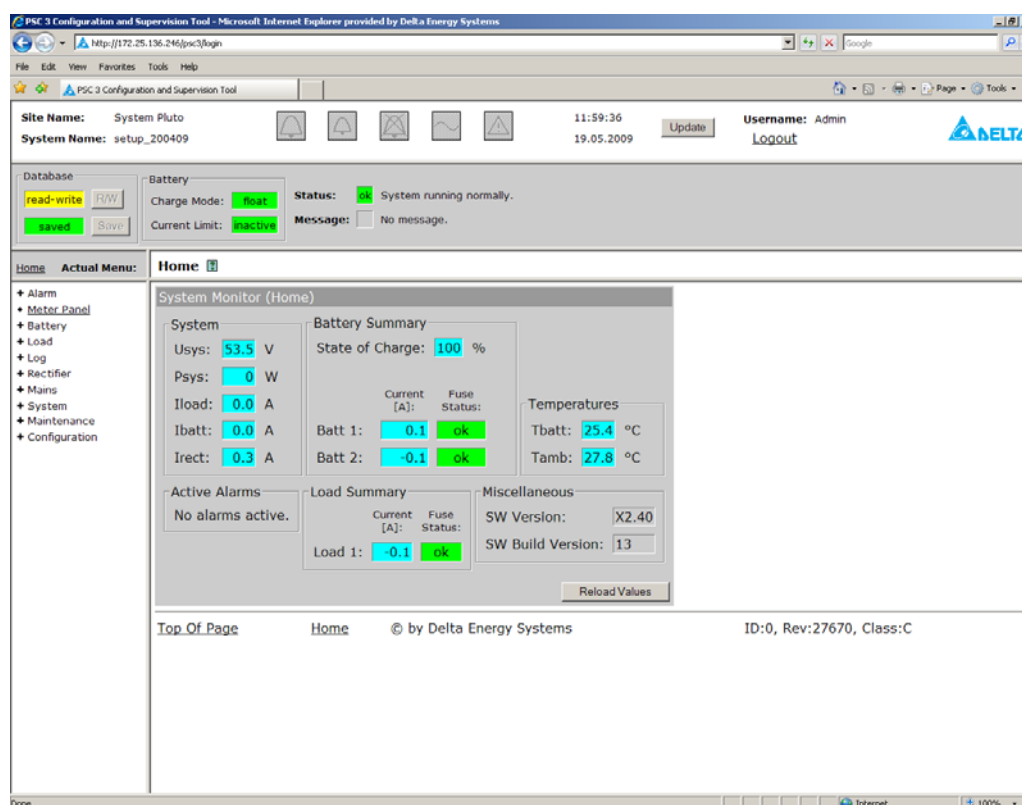


Figure 2. PSC 3 Configuration and Supervision Tool

The Navigation Bar on the left is used to navigate through the dialogue pages:

- Click on „+“ to expand the desired menu.
- Click on „• xxxxx“ to access the desired function / window.
- Click on „?“ to get online help to the active window
- Click on „-“ to collapse the menu.

## 4.1.1 Web user interface menu

Some dialogues are not visible in the navigation bar. These ones are accessible via other dialogues only and are marked in the following figures (\*).

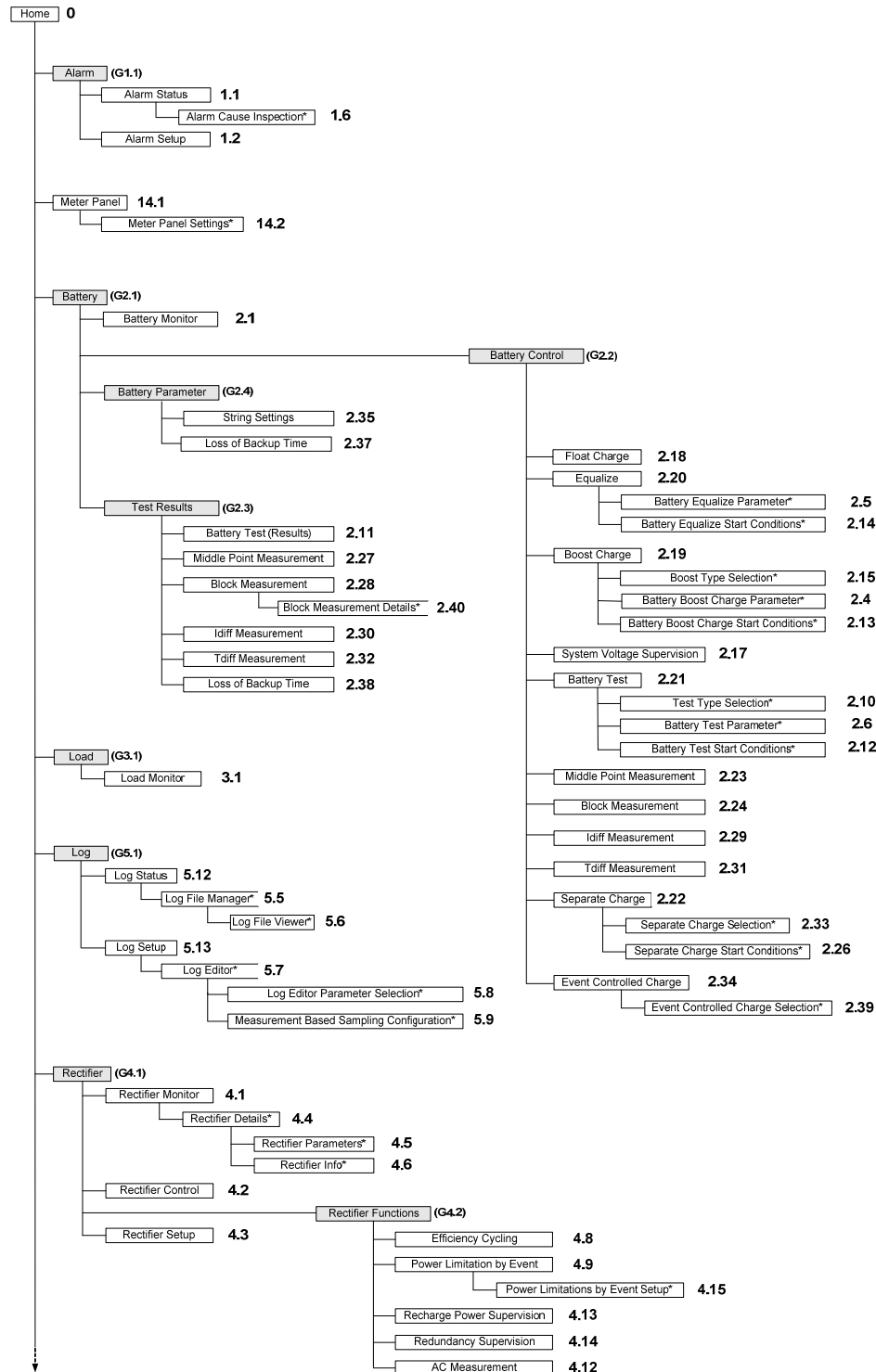


Figure 3. Web user interface menu part 1

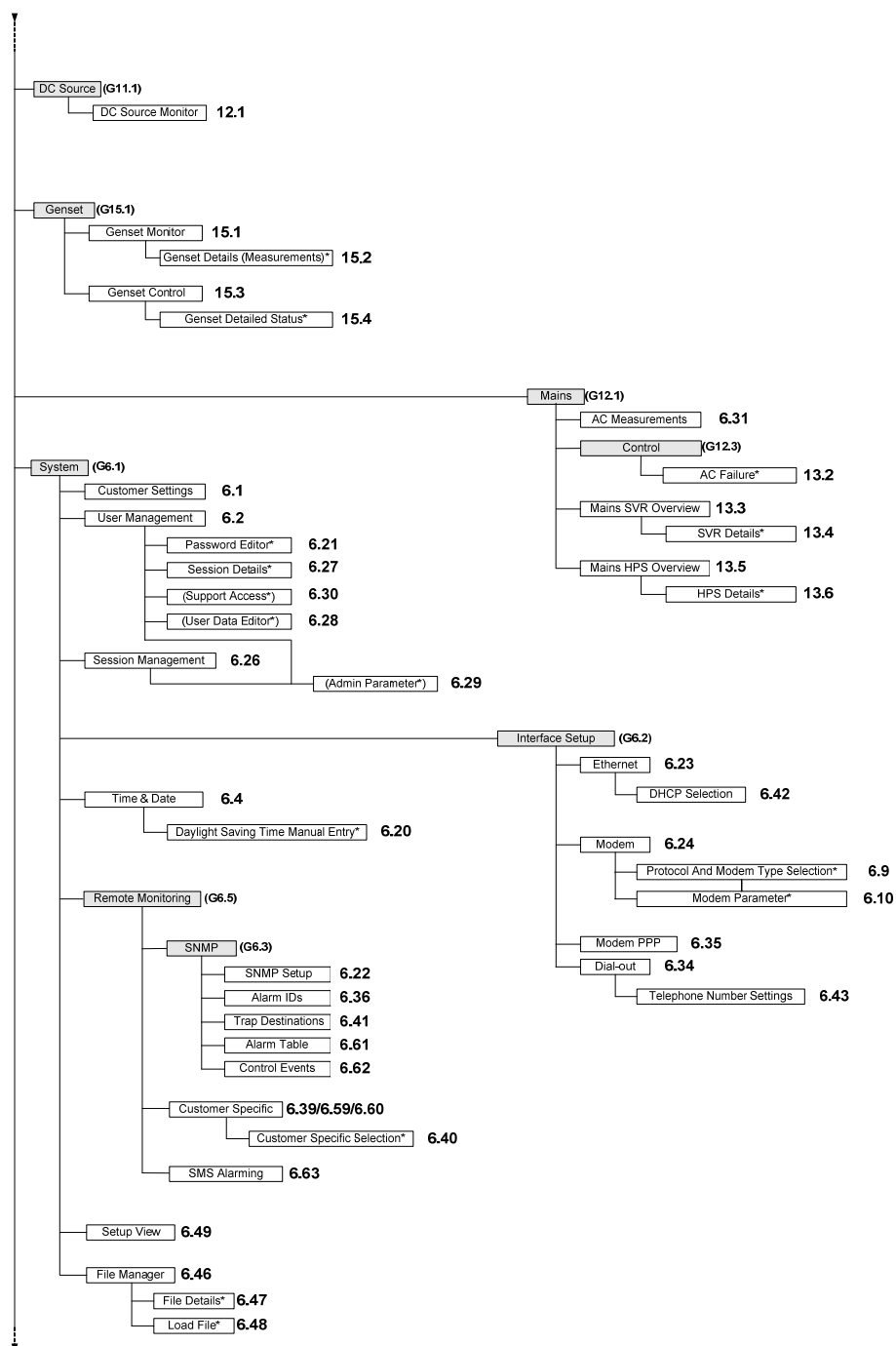


Figure 4. Web user interface menu part 2

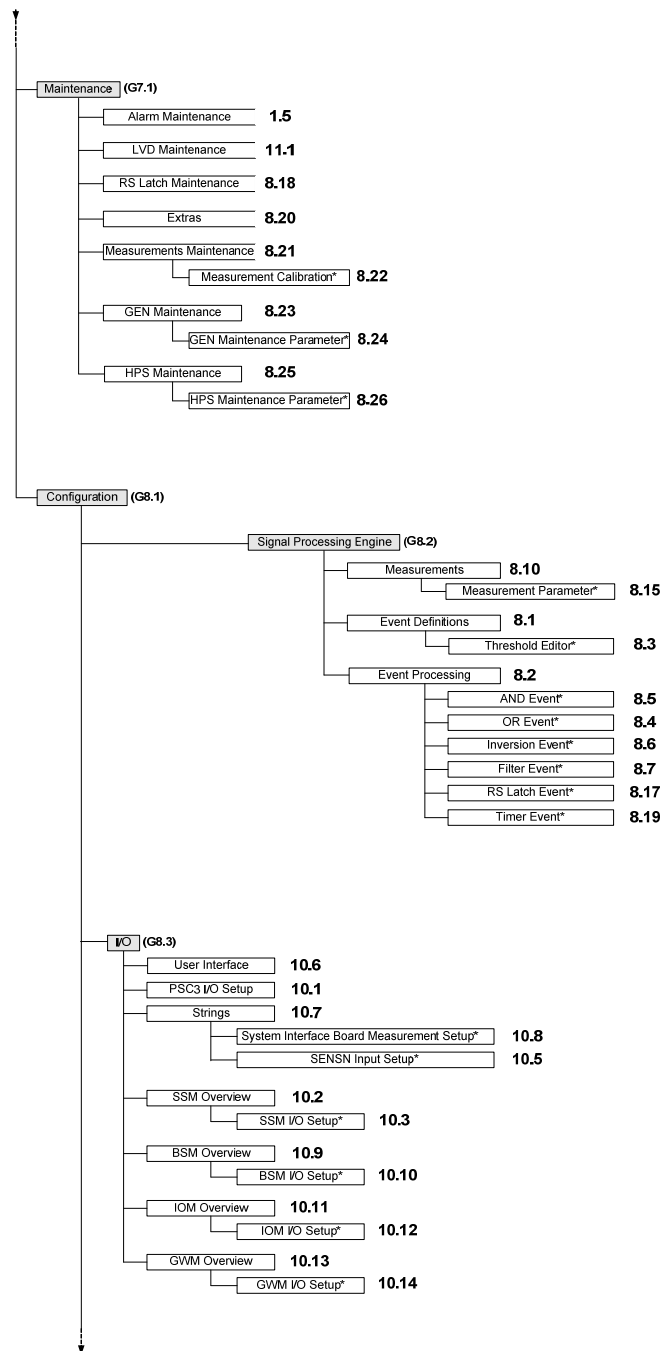


Figure 5. Web user interface menu part 3

(Configuration continued)

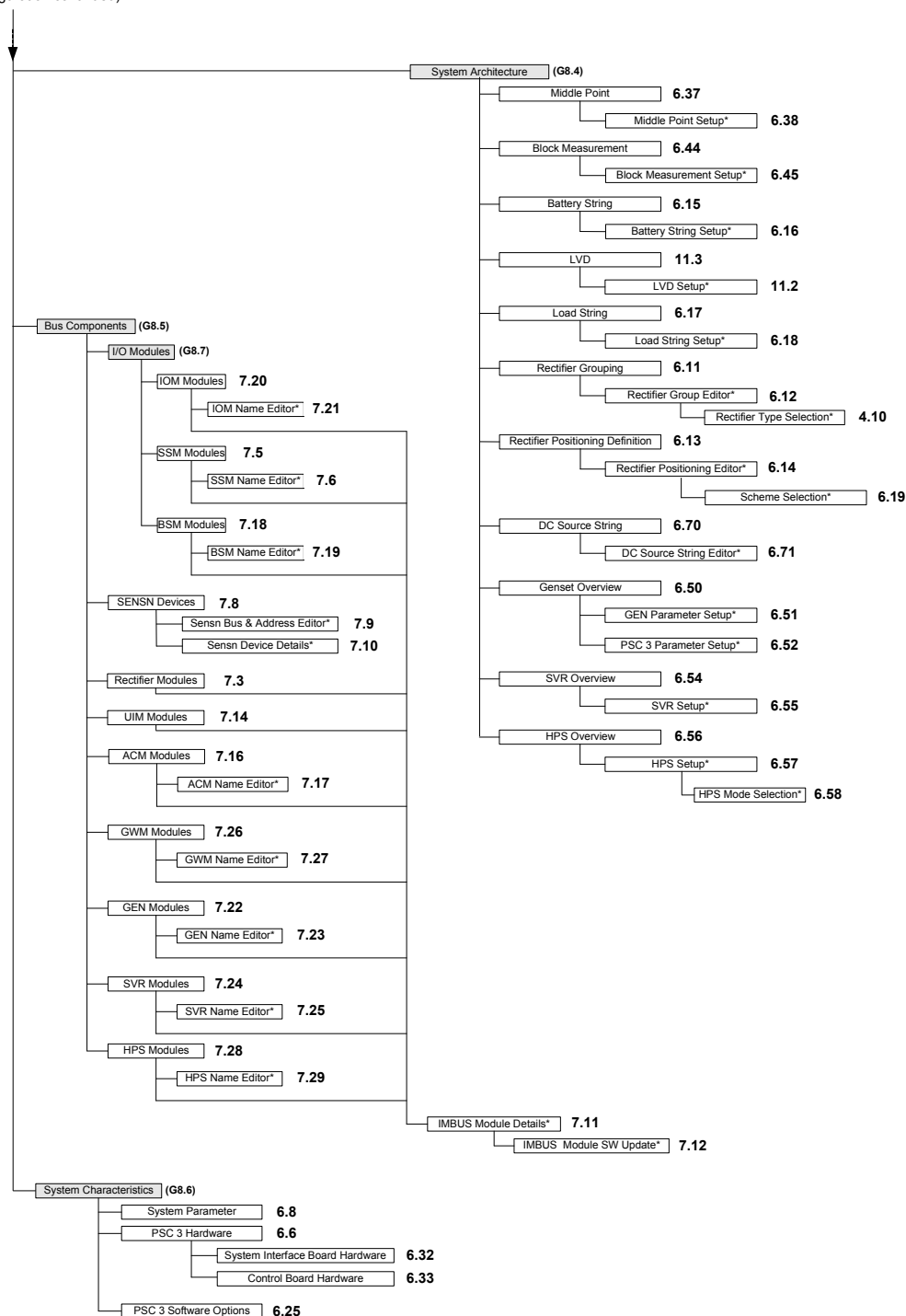


Figure 6. Web user interface menu part 4

## 4.2 Local user interfaces

Through the local interface, essential system configuration and monitoring can be conducted. The local interface provides a 128 x 64 pixel LCD display, keypad for menu navigation, and five configurable LEDs. In most applications, UIL1 meets all demands for local control, even for very large systems.

Because PSC 3 can be mounted within a secure location, it may not be readily available to access the UIL. The functions of the UIL can be repeated in a UIM module, which can be mounted in a more convenient location, such as the cabinet door panel. For more information about the UIM module, see section [6.1 "User Interface Module UIM1"](#).

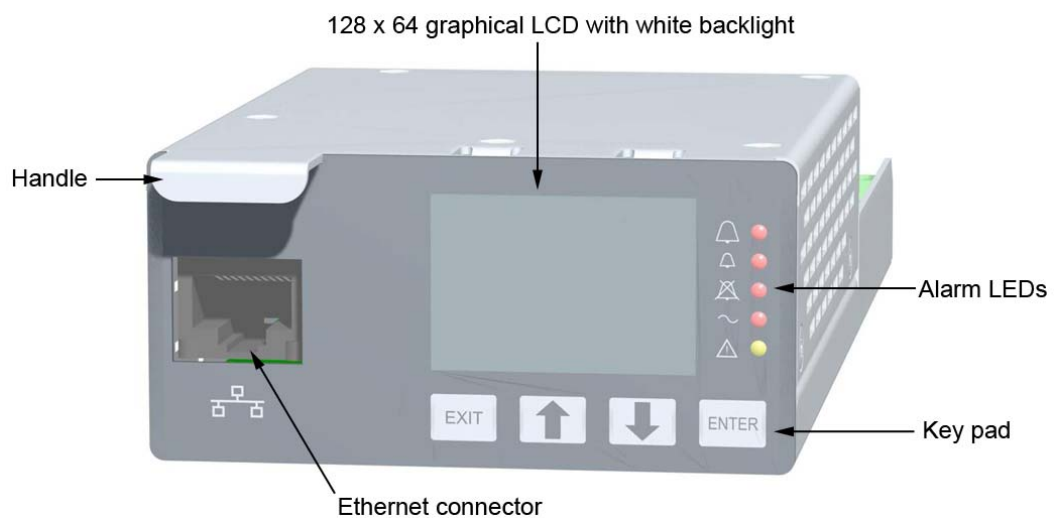
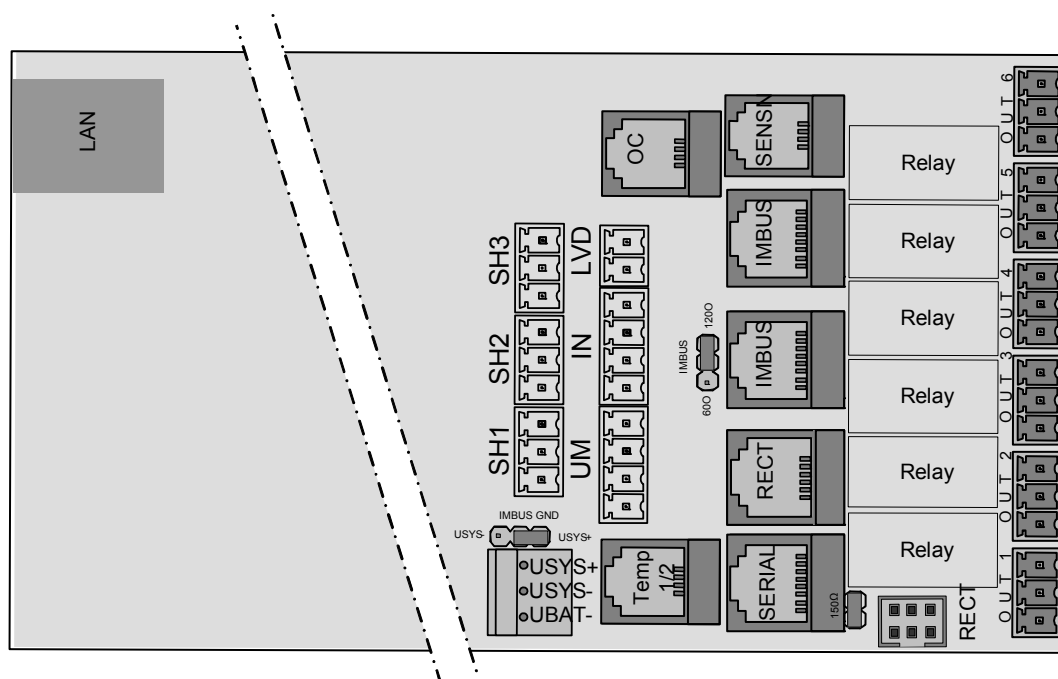


Figure 7. PSC 3 front view

## 5 Physical connections

PSC 3 has an Ethernet connection on the front panel for connection to a computer. This connection can be either direct to the computer, or over a local area network (LAN).

A local user interface (UIL, display with keypad and 5 alarm LEDs) for monitoring and basic configuration functions is provided, see Figure 8.



LAN -	LAN (Ethernet) interface to PC / LAN (front)
UBAT-	Backup power supply PSC 3
USYS-, USYS+	Power supply PSC 3
SH1/2/3	Inputs for shunt measurements (current measurement, fuse supervision analogue)
TEMP1/2	Temperature measurements inputs
UM	4 middle point measurement inputs
IN	4 digital inputs
OC	Open collector digital outputs
Serial	Modem or RS 485 interface (see HW variants)
RECT	IMBUS connector for rectifiers (flat cable without powering) and IMBUS connector for rectifiers (6 pole RJ Teljack without powering)
IMBUS	IMBUS connectors (with powering)
SENSN	Interface for shunt sensor modules
OUT1...6	6 relay outputs 1...6

Figure 8. PSC 3 top view with connectors

All peripheral connections are pluggable, using either telephone jacks or pluggable clamp connections.

## 6 Modules

### 6.1 User Interface Module UIM1

The UIM1 User Interface Module repeats the functions of the local user interface (UIL) on PSC 3. Up to two UIMs can be connected to PSC 3 through the IMBUS.

The UIM provides a 132 x 64 pixel LCD display, keypad, buzzer, and five configurable LEDs.

The UIM does not require configuring to use with PSC 3. Addresses are set with DIP switches internal to the UIM. The UIM is powered by the IMBUS and can be plugged into the IMBUS while the PSC 3 controller is operating. PSC 3 detects and links to the UIM.



**Note!** For compatibility with PSC 3 software version earlier than 1.70, or for use in very large systems, UIM1 consisting of a LCD, keypad, LED indication, and a buzzer is still supported.

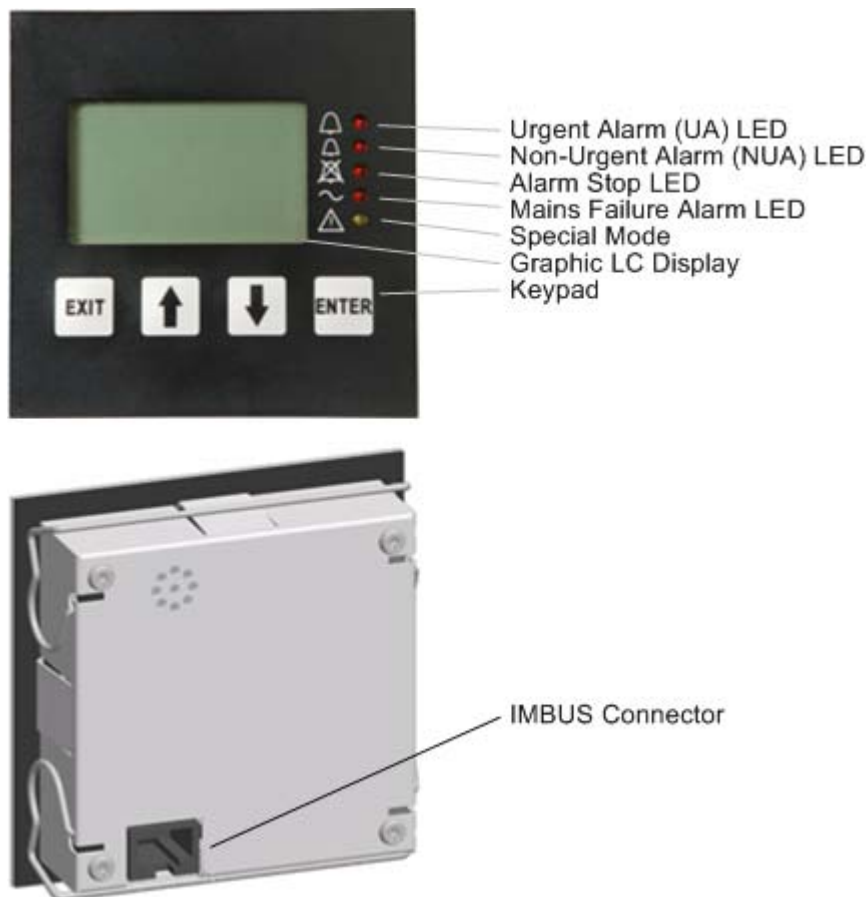


Figure 9. User Interface Module. Front view (top)/Rear view (below)



## 6.2 String Sensor Module SSM

The SSM is a front end module, which can be used to extend the amount of peripherals in a modular manner. Up to 31 SSMs can be connected to the IMBUS. The power supply is provided from the PSC 3.

The SSM provides the following functions:

- 3 relay outputs
- 4 digital inputs
- up to 3 SENSN modules can be connected to the SSM
- 1 voltage, current, temperature, or fuse monitoring per SENSN module

This SSM is available as an open frame module. For DIN Rail mounting, an optional case is available.

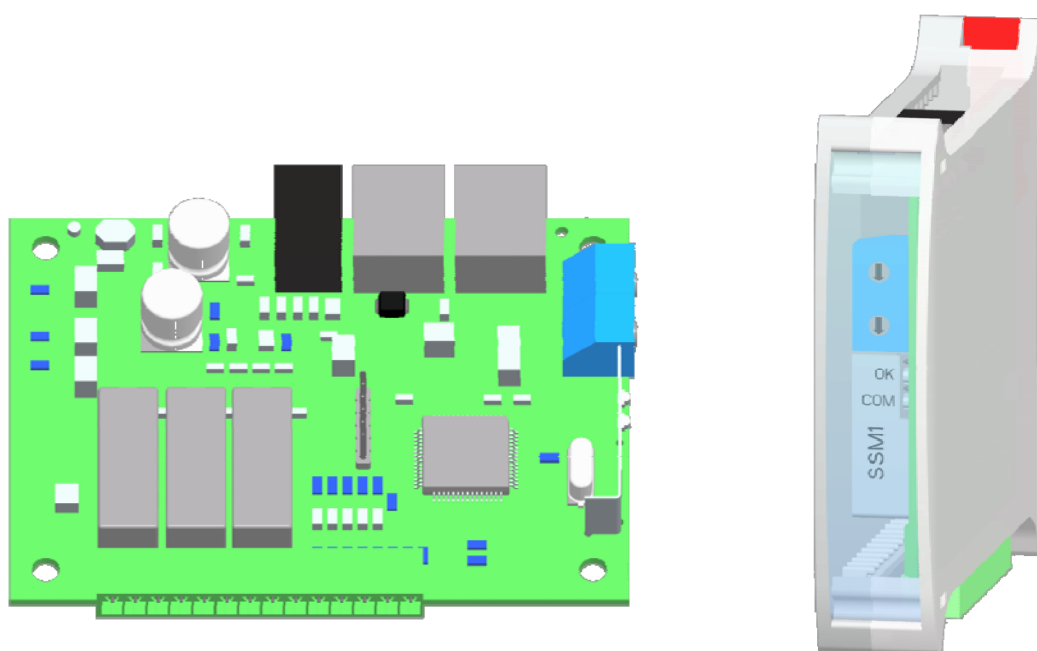


Figure 10. Open and closed frame version of the String Sensor Module (SSM)

## 6.3 Block Voltage Sensor Module BSM

The BSM provides inputs for up to 12 block voltage measurement and 3 digital inputs with software selectable activation and deactivation levels.

The block voltage measurements cover the range  $\pm 77$  Vdc.

With the addition of standard temperature sensor LM335, measurements in the range of -40 to +100 °C can be made.

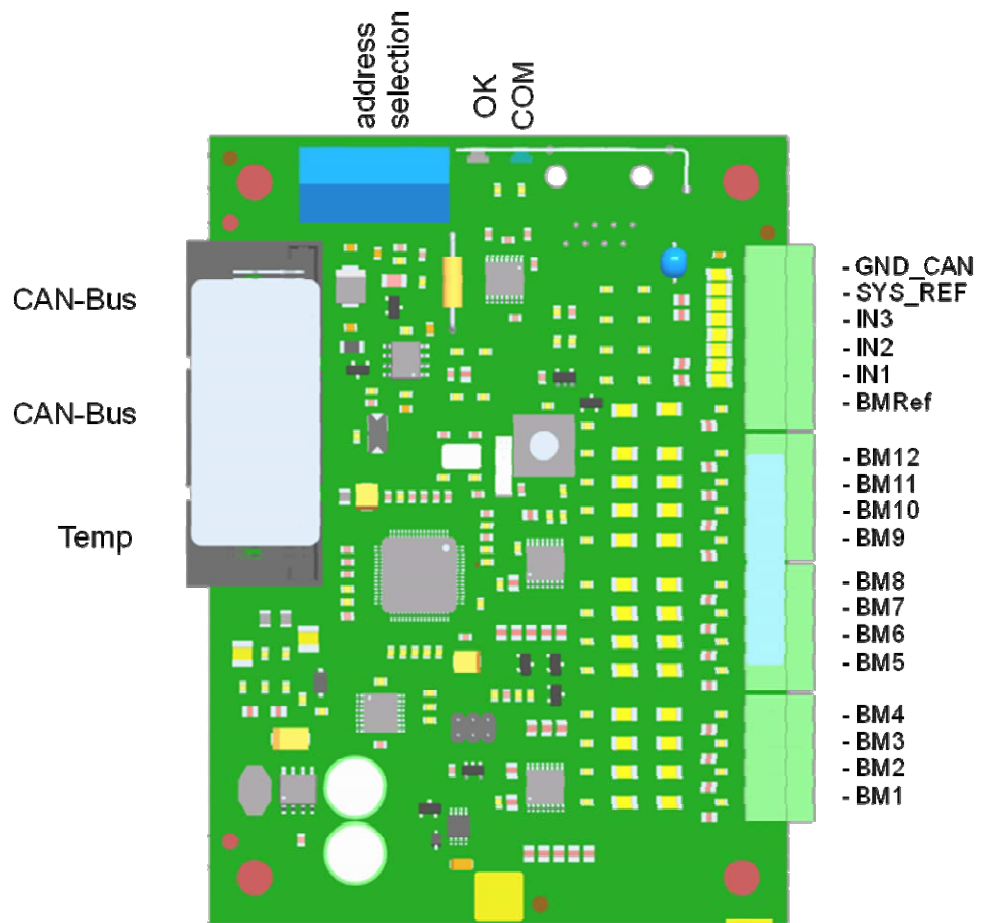


Figure 11. Block Voltage Module BSM ID:A1

## 6.4 Remote Alarm Board IOM-ALARM

The IOM-ALARM is a front end module, which can be used to extend the amount of peripherals in a modular manner. Up to nine IOM-ALARMs can be connected to the IMBUS. The IOM-ALARM is supplied from the 48V system bus.

The IOM-ALARM provides the following functions:

- 10 relay outputs

The IOM-ALARM is available as an open frame module. For DIN Rail mounting an optional case is available.

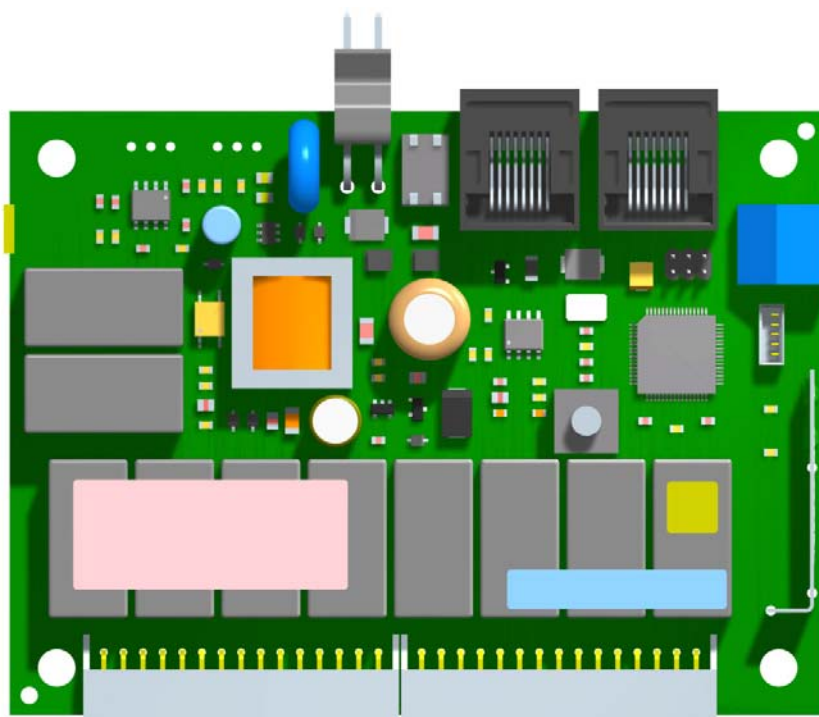


Figure 12. IOM-ALARM

## 6.5 LED Driver Board IOM-LED

The IOM-LED is a front end module, which can be used to extend the amount of peripherals in a modular manner. Up to nine IOM-LEDs can be connected to the IMBUS. The power supply is provided from the PSC 3.

The IOM-LED provides the following functions:

- 20 open collector outputs to drive LEDs
- 2 digital outputs

This IOM-LED is available as an open frame module. For DIN Rail mounting, an optional case is available.

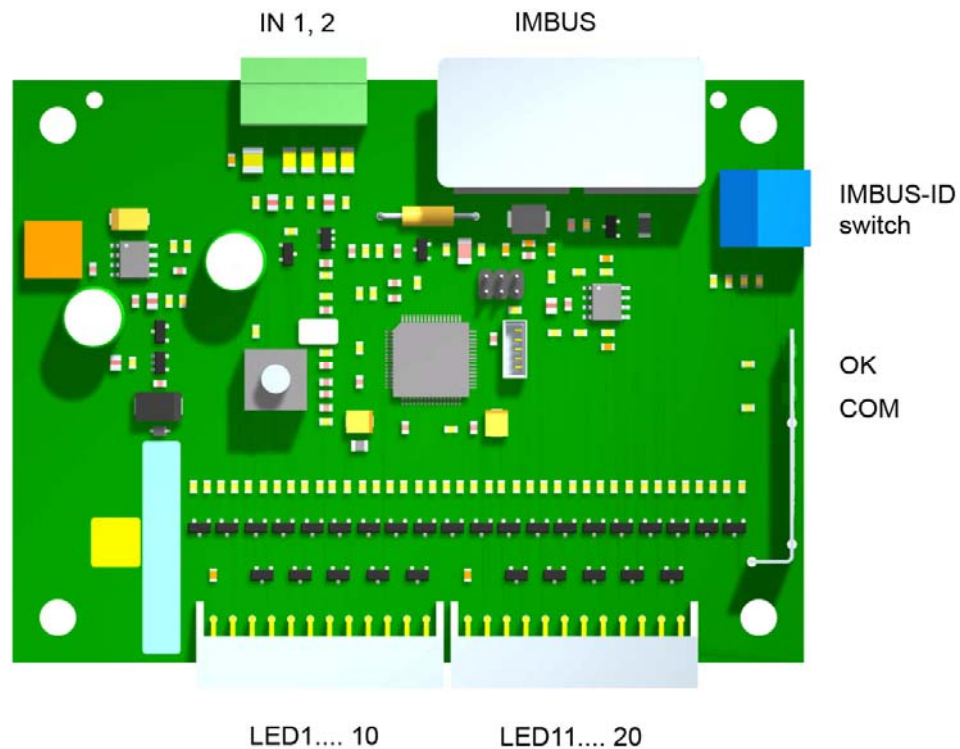


Figure 13. IOM-LED

## 6.6 Input/Output Module IOM-AC

The IOM-AC is a front end module, which can be used to extend the amount of peripherals in a modular manner. Up to nine IOM-ACs can be connected to the IMBUS. The power supply is provided from the PSC 3.

The IOM-AC provides the following functions:

- 6 relay outputs to drive contactors
- 2 digital inputs to detect AC voltages

This IOM-AC is available as an open frame module and needs to be protected on the system level.

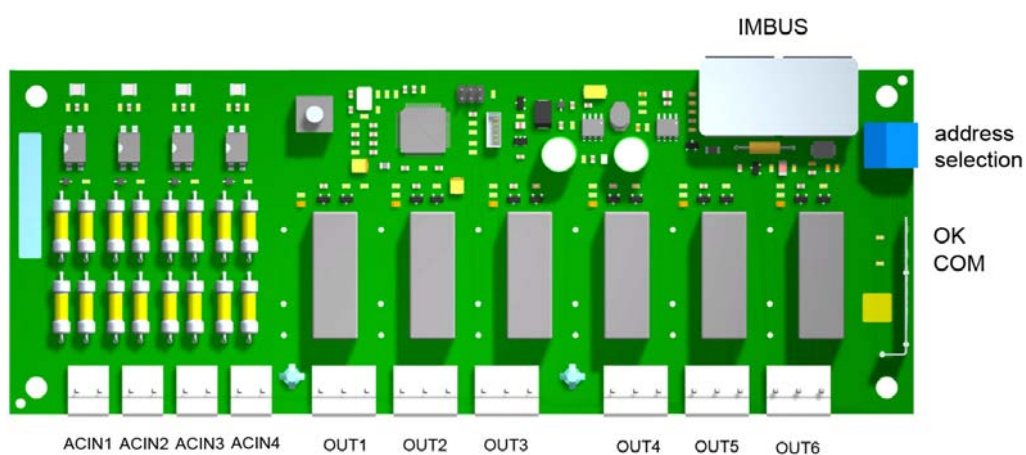


Figure 14. IOM-AC

## 6.7 Healthy Phase Selector HPS

The HPS is a front end module, which can be used to control equipment called Healthy Phase Selector which selects two best phases out of three. As this module measures AC parameters, it can be used also as AC measurement module without the Healthy Phase Selector hardware and function.

The HPS provides the following functions:

- Measurement of voltages, currents, frequency, power and energy
- 3 relay outputs for control purpose

This HPS is available as an open frame module and needs to be protected on the system level.

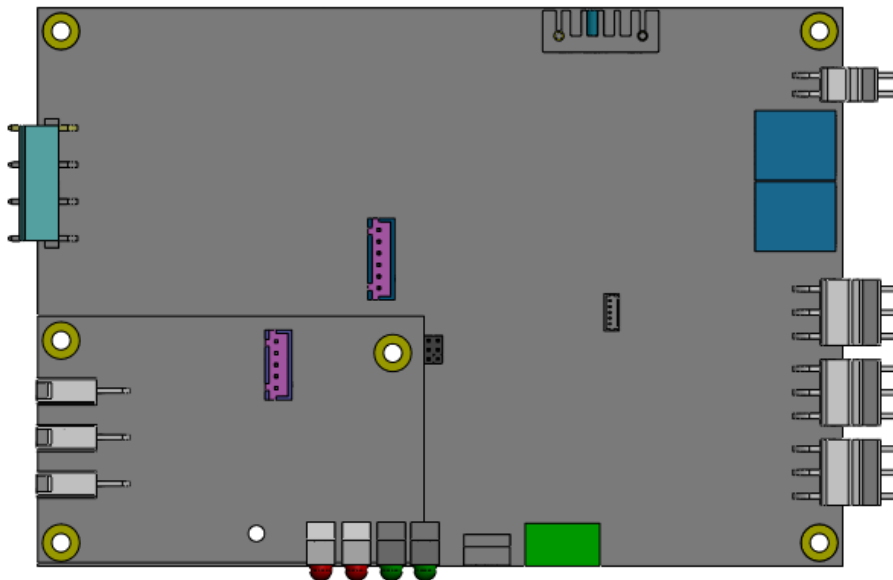


Figure 15. Healthy Phase Selector (HPS)

## 6.8 AC Measurement Gateway Module ACM1

The ACM1 is a gateway between the PSC 3 IMBUS and an external 3-phase AC measurement device using an RS 485 interface with MODBUS protocol.

The following AC measurement devices are supported:

- KRON MULT-K
- Socomec DIRIS Ap
- Socomec DIRIS A40
- General Electric MTDN3
- General Electric MTDN1
- Ably MGE 3

PSC 3 offers also basic AC measurements using the rectifier modules.

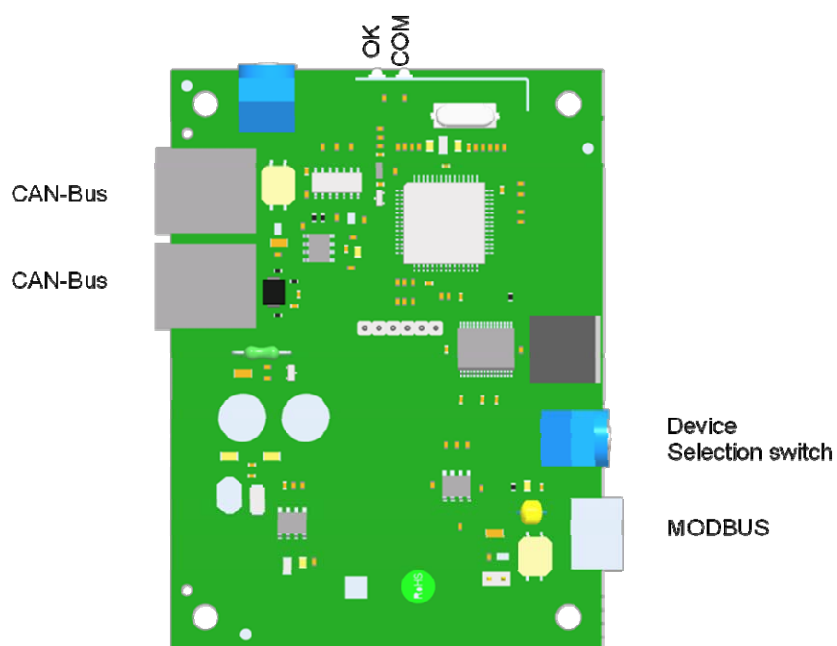


Figure 16. ACM1 AC Measurement Gateway Module

## 6.9 Gateway Module GWM-MODBUS

The GWM-MODBUS is a gateway between the PSC 3 IMBUS and an external DC energy meters using an RS 485 interface with MODBUS protocol. Up to 15 GWM-MODBUS modules can be connected to the IMBUS. The power supply is provided from the PSC 3.

This GWM-MODBUS is available as an open frame module. For DIN Rail mounting, an optional case is available.

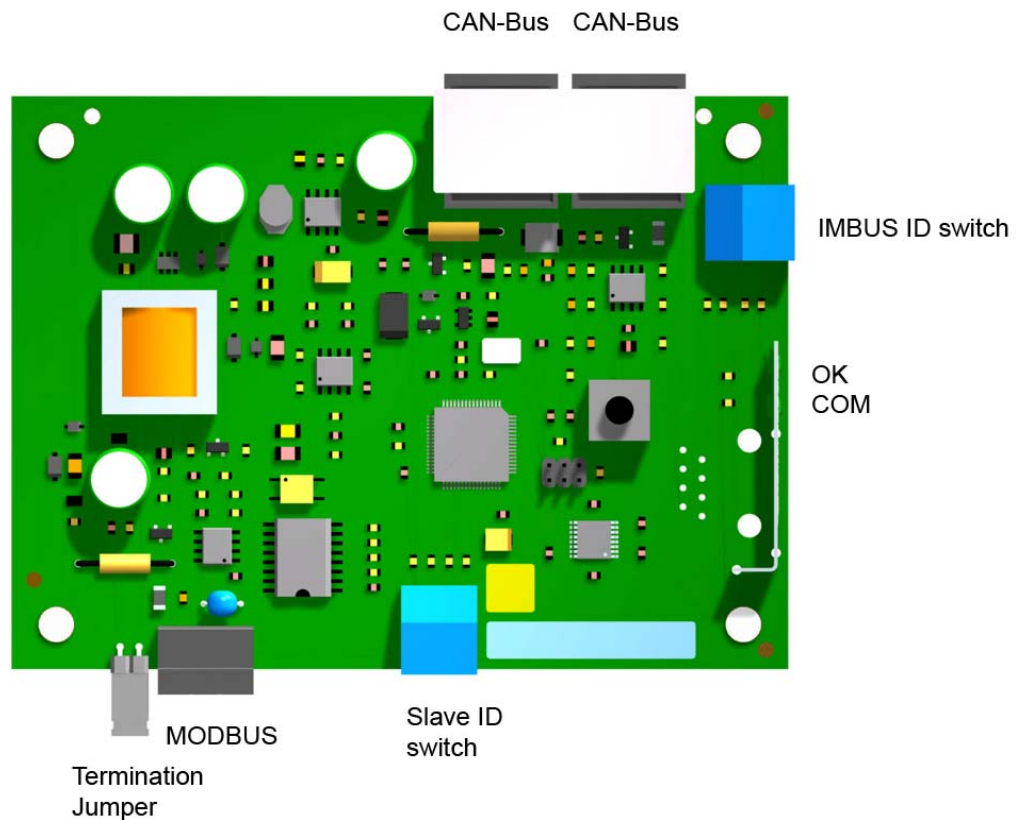


Figure 17. GWM-MODBUS



## 6.10 CAN Repeater Module IMBUSR1

The IMBUSR1 module provides repeater functions in the CAN bus. The IMBUSR1 repeats the bus signals and power supply. This enables large system with a high number of nodes to be constructed without signal loss or degrading of the power supply to the nodes.

### Repeater input CAN1

The repeater input CAN1 is connected to the IMBUS coming from PSC 3. There are two connectors in parallel to allow daisy chaining repeaters in large systems.

### Repeater output CAN2

The output of the repeater can be wired as a start point or as an end-to-end connection. For more information about wiring and bus termination, see *System Installation and Commissioning Manual*.

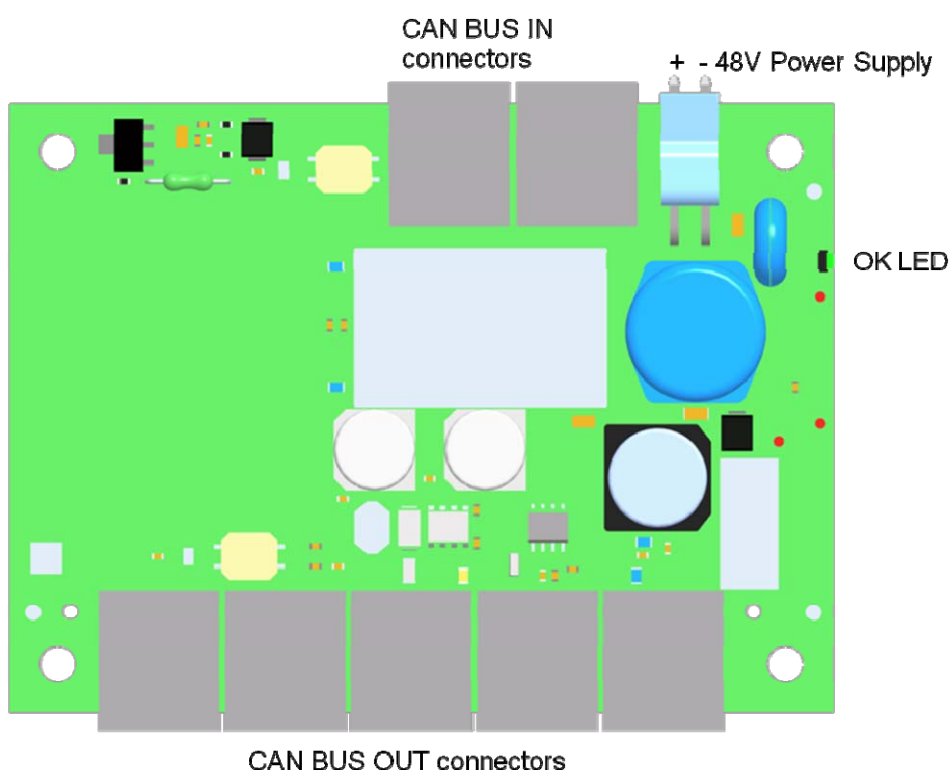


Figure 18. IMBUSR1 CAN Repeater Module

## 6.11 CAN Isolation Module CAN-ISO

The CAN-ISO module provides galvanic isolation in the CAN bus and can be used to interconnect CAN modules having different ground potential. The power supply is provided from the PSC 3, but the CAN modules connected to the secondary side need to be powered from elsewhere.

This CAN-ISO is available as an open frame module or with sheet metal enclosure.

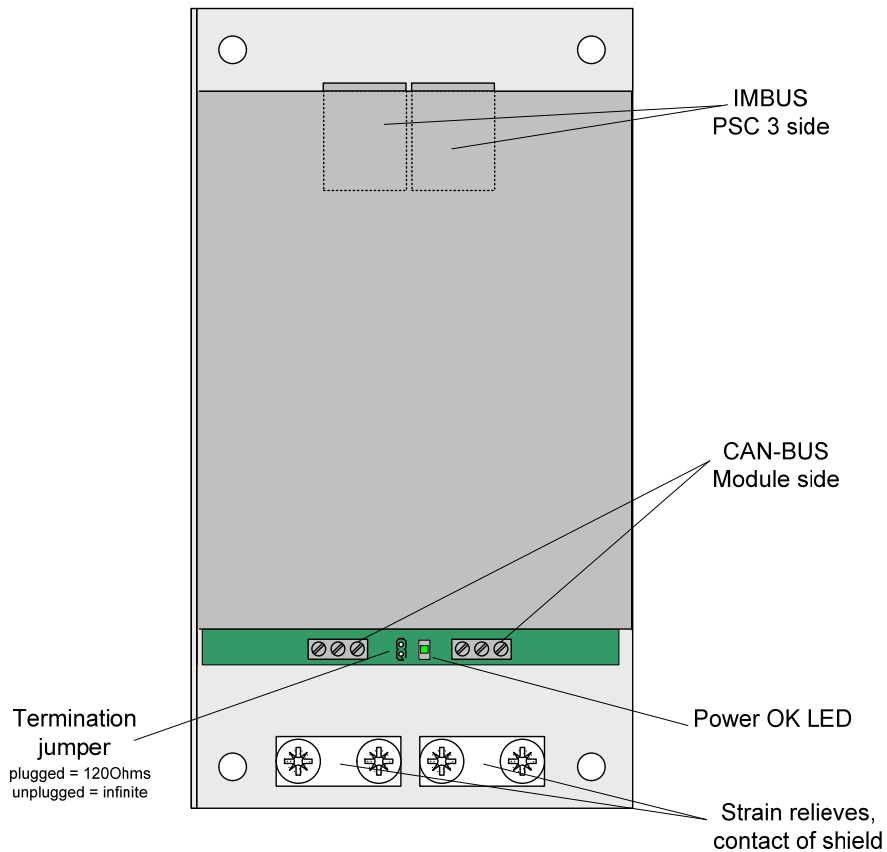


Figure 19. CAN-ISO

## 6.12 Generator Control Module GEN

The GEN module is used to control a genset having no built-in controller. Up to two GEN modules can be connected to the IMBUS. The power supply is provided from the start battery.

The HPS provides the following functions:

- Start and stop control of the engine
- Engine supervision:
  - Oil pressure
  - Temperature
  - Fuel level
  - Battery state
- Measurement of the generator
  - Voltage
  - Current
  - Frequency
  - Power
  - Energy

This GEN is available as an open frame module.

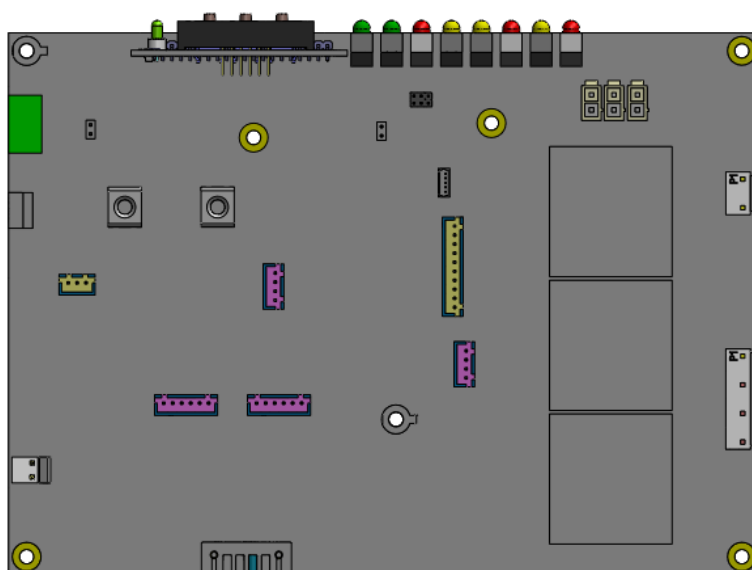


Figure 20. GEN

## 6.13 Static Voltage Regulator Module SVR

The SVR module is used to regulate 1-phase AC voltage from the variable input voltage. This works with static switch to control AC output with help of multiple tap transformer, this board has inbuilt SCR driver/sense circuits, it also includes AMF control and bypass control relay output, Input AC, output AC, Bypass AC(L-N) and transformer temperature monitoring.

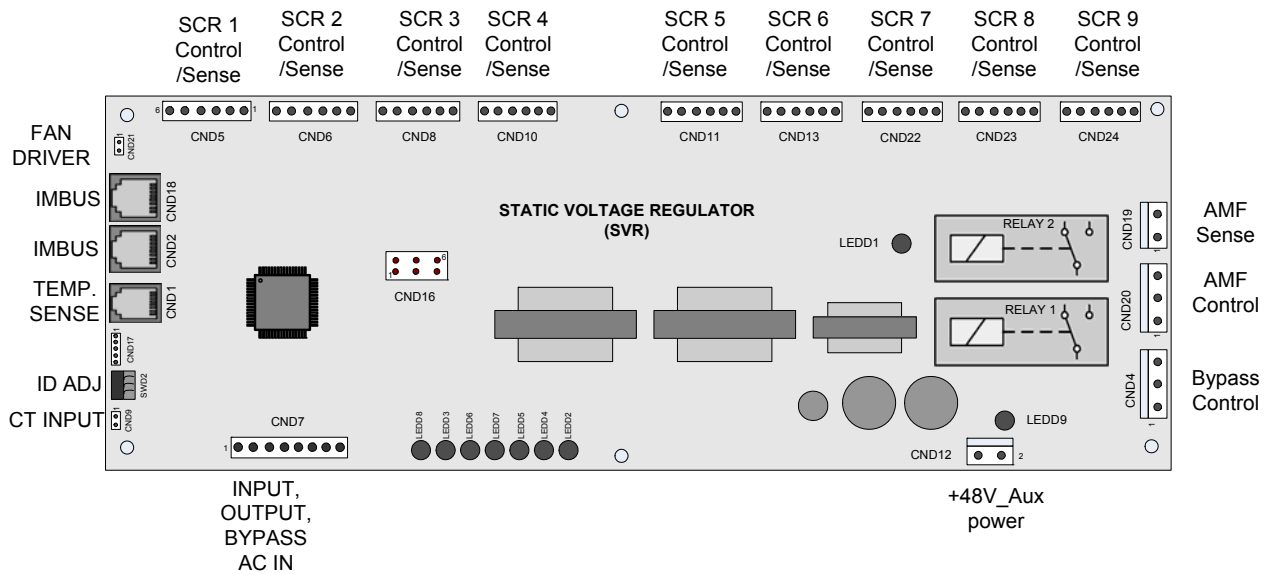


Figure 21. Static Voltage Regulator SVR

## 6.14 PT100 Temperature Sensor Adaptor

The PT100 Temperature Sensor Adaptor provides inputs for up to four PT100 temperature sensors. The output connections allow connection to the PSC 3 controller through the IMBUS bus or through SENSN, SSM1 or BSM IDA1 modules to the PSC 3 controller.

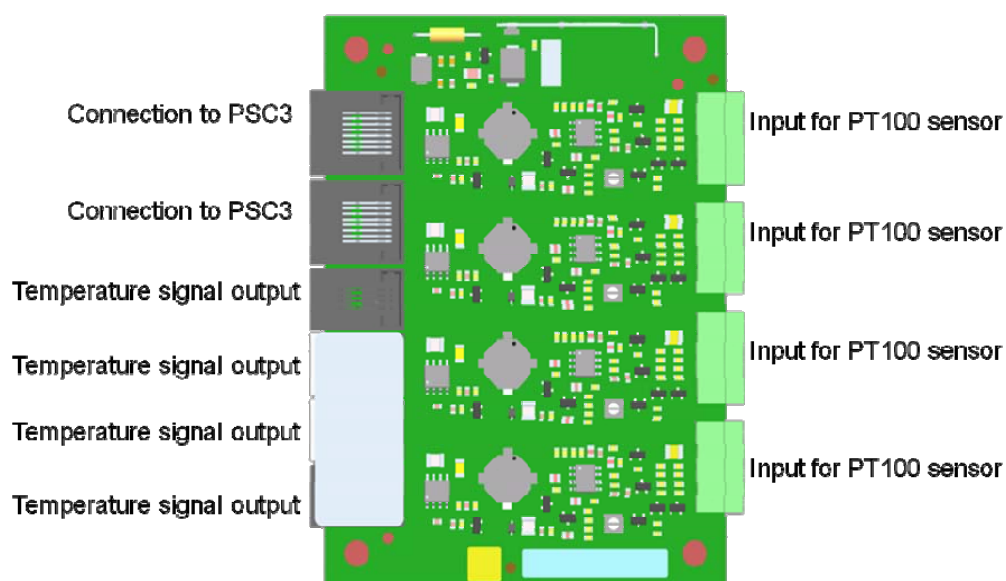


Figure 22. PT100 Temperature Sensor Adaptor

## 6.15 Fan Speed Controller PWM CTRL

The PWM CTRL controls the speed of the fan by using a PWM signal. PWM CTRL is powered from 48V system bus and it is not connected to the IMBUS.

The PWM CTRL provides the following functions:

- Two digital inputs compatible with PSC 3 open collector outputs to select the duty ratio
- Four predefined duty ratios:
  - 0 %
  - 40 %
  - 65 %
  - 100 %

This SSM is available as an open frame module. For DIN Rail mounting, an optional case is available.

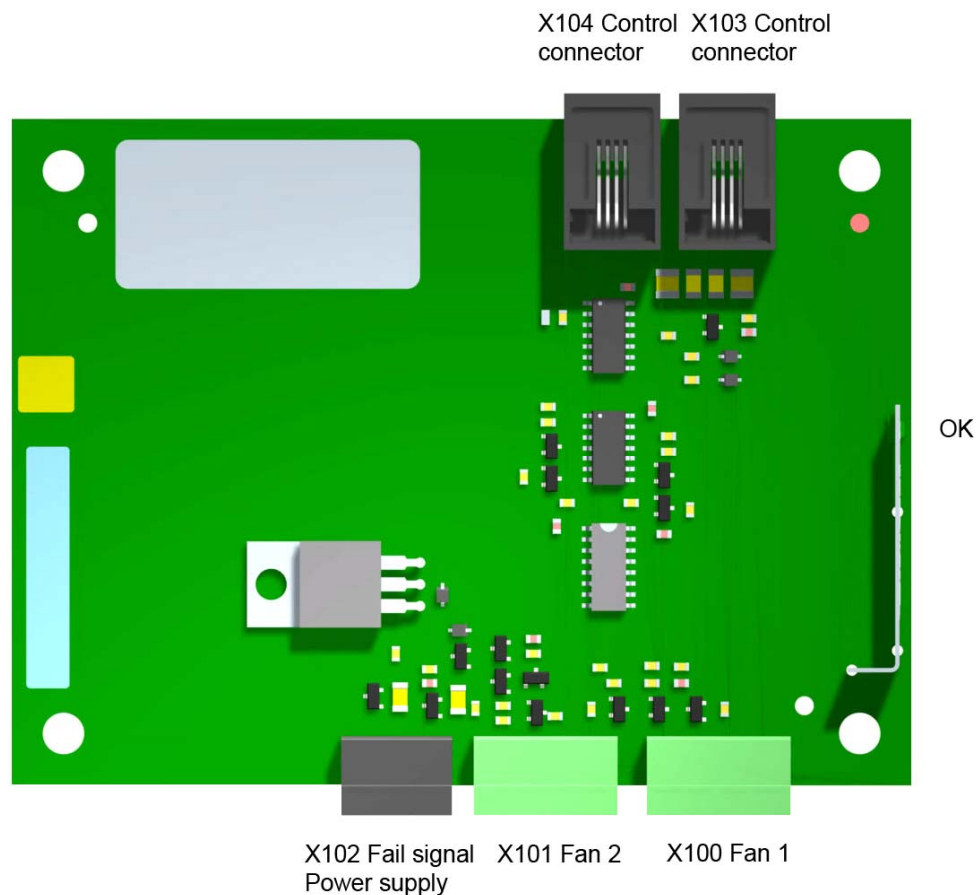


Figure 23. Fan Speed Controller PWM/CTRL

## 6.16 SENSN device

The SENSN device is a front end module, which is assembled directly onto the shunt. This module monitors different strings in the power system individually. Up to 3 SENSN devices can be connected to a PSC 3 or to each string sensor module SSM. The power supply is provided from the PSC 3 or SSM.

One SENSN provides the following functions:

- 1 string current measurement (shunt)
- 1 string voltage measurement
- 1 temperature
- 1 string fuse monitoring

address selection

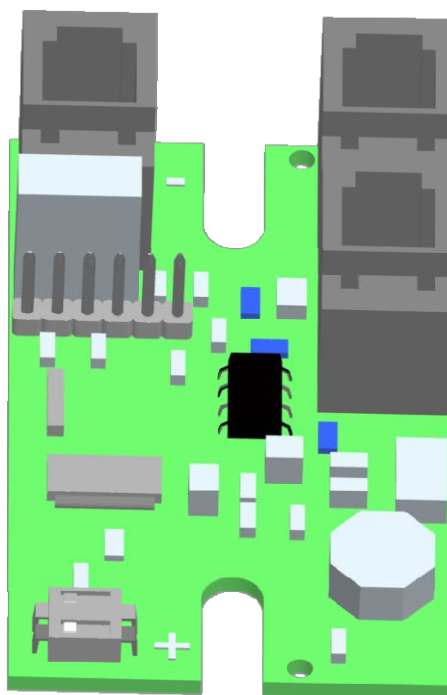
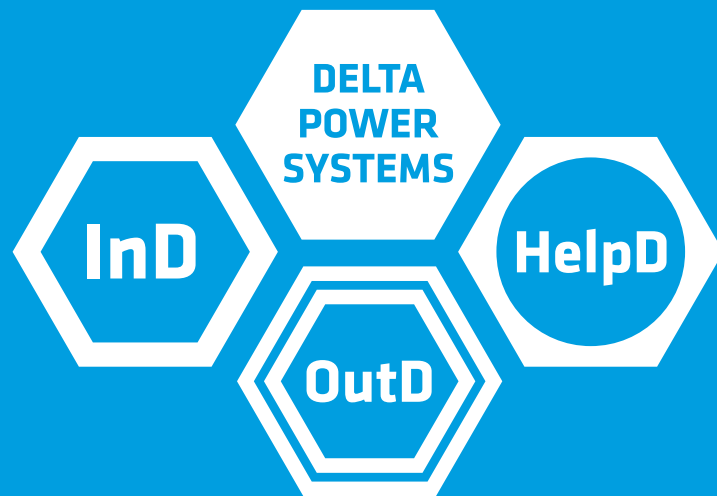


Figure 24. SENSN device



Our InD, OutD and HelpD series are designed to complement each other. InD stands for indoor power systems, while OutD solutions are created for demanding outdoor use. HelpD is our global support team; its task is to make everything easy for you. The full range of Delta Power Systems keeps you powered and allows you to concentrate on what is most important for you – your business.

[www.deltapowersolutions.com](http://www.deltapowersolutions.com)

